

**WHAT IS CLAIMED IS:**

1. A method for stopping iterative decoding in a turbo decoder performing iterative decoding on a received frame comprised of information bits  
5 and then outputting iteratively decoded results, comprising the steps of:

sequentially outputting absolute LLR (Log Likelihood Ratio) ( $|LLR|$ ) values associated with respective information bits of the received frame by the iterative decoding;

- selecting a minimum value  $M(i)$  among the sequentially output absolute  
10 LLR values;

issuing a command to stop the iterative decoding, if the minimum value  $M(i)$  is larger than a first threshold determined based on a minimum value  $F_{min}$  among absolute LLR values output through previous iterative decoding; and

- stopping the iterative decoding after additionally performing the iterative  
15 decoding once on the received frame in response to the command, and outputting the decoded results upon stopping.

2. The method as claimed in claim 1, wherein the first threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $F_{min}$ .  
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3. The method as claimed in claim 1, further comprising the step of continuously performing the iterative decoding after updating the minimum value  $F_{min}$  with the minimum value  $M(i)$  if the minimum value  $M(i)$  is less than or equal to the first threshold.  
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4. The method as claimed in claim 1, further comprising the step of comparing a newly output absolute LLR value ( $|LLR(k)|$ ) with a minimum absolute LLR value ( $|LLR(i)|$ ) in up to the previous decoding process for a currently decoded frame and outputting a smaller value as the minimum value

M(i).

5. The method as claimed in claim 1, further comprising the step of stopping the iterative decoding and then outputting the decoded results upon  
5 stopping, if the iterative decoding has been iterated a preset number of times.

6. A method for stopping iterative decoding in a turbo decoder performing iterative decoding on a received frame comprised of information bits and then outputting iteratively decoded results, comprising the steps of:

10 sequentially outputting absolute LLR ( $|LLR|$ ) values associated with respective information bits of the received frame by the iterative decoding;

selecting a minimum value M(i) among the sequentially output absolute LLR ( $|LLR|$ ) values;

issuing a command to stop the iterative decoding when the selected  
15 minimum value M(i) is satisfied with both of the following two conditions, (1) the one is a case where the minimum value M(i) is larger than a first threshold T1(i) determined based on a minimum value  $F_{min}$  among minimum values M(i) output through previous iterative decoding, and (2) the other is a case where the minimum value M(i) is larger than a second threshold T2(i) determined based on  
20 a minimum value  $I_{min}$  among minimum values M(i) satisfying the aforesaid condition (1); and

stopping the iterative decoding in response to the command and then outputting the decoded results at the stop point.

25 7. The method as claimed in claim 6, wherein the first threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $F_{min}$ .

8. The method as claimed in claim 6, wherein the second threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $I_{min}$ .

9. The method as claimed in claim 6, further comprising the step of continuously performing the iterative decoding after updating the minimum value  $F_{\min}$  with the minimum value  $M(i)$  if the minimum value  $M(i)$  is less than or  
5 equal to the first threshold.

10. The method as claimed in claim 6, further comprising the step of continuously performing the iterative decoding after updating the minimum value  $I_{\min}$  with the minimum value  $M(i)$  if the minimum value  $M(i)$  is less than or equal  
10 to the second threshold.

11. The method as claimed in claim 6, further comprising the step of comparing a newly output absolute LLR value  $|LLR(k)|$  with a minimum absolute LLR value ( $|LLR(i)|$ ) in up to the previous decoding process for a  
15 currently decoded frame, and outputting a smaller value as the minimum value  $M(i)$ .

12. The method as claimed in claim 6, further comprising the step of stopping the iterative decoding and then outputting the decoded results upon  
20 stopping, if the iterative decoding has been iterated a preset number of times.

13. An apparatus for stopping iterative decoding in a turbo decoder performing iterative decoding on a received frame comprised of information bits and then outputting iteratively decoded results, comprising:  
25 a turbo decoder for sequentially outputting absolute LLR ( $|LLR|$ ) values associated with respective information bits of the received frame by the iterative decoding, and stopping the iterative decoding in response to a stop command for the iterative decoding;

a minimum absolute LLR detector for selecting a minimum value  $M(i)$

among the sequentially output absolute LLR ( $|LLR|$ ) values ;

a comparison selector for comparing said minimum value  $M(i)$  with a first threshold and updating threshold in accordance with the minimum absolute LLR values output from the minimum absolute LLR detector; and

- 5 a controller for issuing a command to stop the iterative decoding, if the minimum value  $M(i)$  is larger than the first threshold determined based on a minimum value  $F_{\min}$  among absolute LLR ( $|LLR|$ ) values output through previous iterative decoding.

- 10 14. The apparatus as claimed in claim 13, wherein the turbo decoder stops the iterative decoding after additionally performing the iterative decoding once on the received frame in response to the stop command, and then outputs the decoded results upon stopping.

- 15 15. The apparatus as claimed in claim 13, wherein the first threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $F_{\min}$ .

16. The apparatus as claimed in claim 13, further comprising a comparison selector for updating the minimum value  $F_{\min}$  with the minimum  
20 value  $M(i)$  if the minimum value  $M(i)$  is less than or equal to the first threshold.

17. The apparatus as claimed in claim 13, where the minimum absolute LLR detector compares a newly output absolute LLR value  $|LLR(k)|$  with a minimum absolute LLR value ( $|LLR(i)|$ ) in up to the previous decoding  
25 process for a currently decoded frame, and outputting a smaller value as the minimum value  $M(i)$ .

18. The apparatus as claimed in claim 17, wherein the minimum absolute LLR detector comprises:

a first selector for receiving an initialized maximum value and the minimum absolute LLR ( $|LLR|$ ) value  $M(i)$ , and selecting one of the threshold and the minimum absolute LLR ( $|LLR|$ ) value in response to a first select signal from the controller;

5 a comparator for comparing the sequentially output absolute LLR ( $|LLR|$ ) values with the output of the first selector, and outputting a second select signal according to the compared results; and

a second selector for selecting one of the sequentially output absolute LLR ( $|LLR|$ ) value and the output of the first selector in response to the second  
10 select signal from the comparator, as the minimum absolute LLR ( $|LLR|$ ) value  $M(i)$ .

19. The apparatus as claimed in claim 13, wherein the controller issues a command to stop the iterative decoding, if the iterative decoding has  
15 been iterated a preset number of times.

20. An apparatus for stopping iterative decoding in a turbo decoder performing iterative decoding on a received frame comprised of information bits and then outputting iteratively decoded results, comprising:

20 a turbo decoder for sequentially outputting absolute LLR ( $|LLR|$ ) values associated with respective information bits of the received frame by the iterative decoding, and stopping the iterative decoding in response to a stop command for the turbo decoding;

a minimum LLR detector for selecting a minimum value  $M(i)$  among the  
25 sequentially output absolute LLR ( $|LLR|$ ) values;

a comparison selector for comparing said minimum value  $M(i)$  with a first threshold and in sequence comparing said minimum value  $M(i)$  with a second threshold and updating thresholds in accordance with the minimum absolute LLR values output from the minimum absolute LLR detector; and

a controller for issuing a command to stop the iterative decoding, if the minimum value  $M(i)$  is larger than the first threshold  $T_1(i)$  determined based on a minimum value  $F_{\min}$  among absolute LLR ( $|LLR|$ ) values output through previous iterative decoding and is also larger than the second threshold  $T_2(i)$  determined based on a minimum value  $I_{\min}$  representing the minimum value among minimum absolute LLR ( $|LLR|$ ) values that has satisfied the first stop condition in up to the previous decoding process for a currently decoded frame.

21. The apparatus as claimed in claim 20, wherein the first threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $F_{\min}$ .

22. The apparatus as claimed in claim 21, wherein the second threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $I_{\min}$ .

23. The apparatus as claimed in claim 21, further comprising a comparison selector for updating the minimum value  $F_{\min}$  with the minimum value  $M(i)$  if the minimum value  $M(i)$  is less than or equal to the first threshold.

24. The apparatus as claimed in claim 23, wherein the comparison selector updates the minimum value  $I_{\min}$  with the minimum value  $M(i)$  if the minimum value  $M(i)$  is less than or equal to the second threshold.

25. The apparatus as claimed in claim 21, wherein the minimum absolute LLR detector compares a newly output absolute LLR value  $|LLR(k)|$  with a minimum absolute LLR value ( $|LLR(i)|$ ) in up to the previous decoding process for a currently decoded frame, and outputs a smaller value as the minimum value  $M(i)$ .

26. The apparatus as claimed in claim 25, wherein the minimum absolute LLR detector comprises:

a first selector for receiving an initialized maximum value and the minimum absolute LLR value  $M(i)$ , and selecting one of the threshold and the  
5 minimum absolute LLR value in response to a first select signal from the controller;

a comparator for comparing the sequentially output absolute LLR values with the output of the first selector, and outputting a second select signal according to the compared results; and

10 a second selector for selecting one of the sequentially output absolute LLR value and the output of the first selector in response to the second select signal from the comparator, as the minimum absolute LLR value  $M(i)$ .

27. The apparatus as claimed in claim 21, wherein the controller  
15 issues a command to stop the iterative decoding, if the iterative decoding has been iterated a preset number of times.

28. A method for stopping iterative decoding in a turbo decoder, comprising the steps of:

20 outputting results of iterative decoding performed on a received frame comprised of information bits, and sequentially outputting absolute LLR ( $|LLR|$ ) values associated with the respective information bits;

performing error checking on the received frame using CRC (Cyclic Redundancy Check) bits for the decoded results, and outputting error checking  
25 results;

requesting a stop to the iterative decoding, if a minimum value  $M(i)$  among the sequentially output absolute LLR ( $|LLR|$ ) values is larger than a threshold determined based on a minimum value  $F_{min}$  among absolute LLR ( $|LLR|$ ) values output through previous iterative decoding;

issuing a command to stop the iterative decoding, based on the error checking results and in response to the stop request for the iterative decoding; and

stopping the iterative decoding after additionally performing the iterative decoding once on the received frame in response to the command, and then outputting the decoded results upon stopping.

29. The method as claimed in claim 28, wherein the threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $F_{\min}$ .

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30. The method as claimed in claim 28, further comprising the step of continuously performing the iterative decoding after updating the minimum value  $F_{\min}$  with the minimum value  $M(i)$  if the minimum value  $M(i)$  is less than or equal to the threshold.

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31. The method as claimed in claim 28, further comprising the step of issuing a command to stop the iterative decoding if any of the error checking results and the stop request for the iterative decoding is provided.

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32. An apparatus for stopping iterative decoding in a turbo decoder, comprising:

a turbo decoder for outputting results of iterative decoding performed on a received frame comprised of information bits, and sequentially outputting absolute LLR ( $|LLR|$ ) values associated with the respective information bits;

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a CRC detector for performing error checking on the received frame using CRC bits for the decoded results, and outputting error checking results;

an LLR stop controller for requesting a stop to the iterative decoding, if a minimum value  $M(i)$  among the sequentially output absolute LLR ( $|LLR|$ ) values is larger than a threshold determined based on a minimum value  $F_{\min}$



among absolute LLR ( $|LLR|$ ) values output through previous iterative decoding and additionally is larger than a threshold determined based on a minimum value  $I_{\min}$  represented the minimum value among minimum absolute LLR ( $|LLR|$ ) values that has satisfied the first stop condition in up to the previous decoding  
 5 process for a currently decoded frame ; and

a stop selection controller for issuing a command to stop the iterative decoding being performed by the turbo decoder, based on the error checking results and in response to the stop request for the iterative decoding.

10 33. The apparatus as claimed in claim 32, wherein the threshold is determined by adding a preset adding factor  $T_f$  to the minimum value  $F_{\min}$ .

34. The apparatus as claimed in claim 32, wherein the LLR stop controller updates updating the minimum value  $F_{\min}$  with the minimum value  
 15  $M(i)$  if the minimum value  $M(i)$  is less than or equal to the threshold.

35. The apparatus as claimed in claim 32, wherein the stop selection controller issues a command to stop the iterative decoding if any of the error checking results and the stop request for the iterative decoding is provided.